

CALIBRATION STANDARD SPECIFICATION  
FOR AN  
ANALOG STORAGE OSCILLOSCOPE MAINFRAME  
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PROCUREMENT PACKAGE

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CALIBRATION STANDARD SPECIFICATION FOR AN  
ANALOG STORAGE OSCILLOSCOPE MAINFRAME

1. SCOPE

1.1 Scope. This specification defines the mechanical, electrical, and electronic characteristics for an Analog Storage Oscilloscope Mainframe. The equipment is intended to be used by Navy personnel in shipboard and shorebased laboratories to perform in measuring and recording single-occurrence real time domain events, when used with Tektronix 7000 series plug-ins. For the purposes of this specification, the Analog Storage Oscilloscope Mainframe shall be referred to as the Scope.

2. APPLICABLE DOCUMENTS

2.1 Controlling Specifications. MIL-T-28800, "Military Specification, Test Equipment for use with Electrical and Electronic Equipment, General specification for," and all documents referenced therein of the issues in effect on the date of this solicitation shall form a part of this specification.

3. REQUIREMENTS

3.1 General. The scope shall conform to the Type II, Class 5, Style E requirements as specified in MIL-T-28800 for Navy shipboard and shorebased as modified below. The use of material restricted for Navy use shall be governed by MIL-T-28800.

3.1.1 Design and Construction. The Scope design and construction shall meet the requirements of MIL-T-28800 for Type II equipment.

3.1.2 Power Requirements. The Scope shall operate from a source of 103.5V to 126.5V at 60 Hz  $\pm$  5% single-phase input power as specified in MIL-T-28800.

3.1.3 Dimensions and Weight. Maximum dimensions shall not exceed 15 inches in width, 15 inches in height, and 20 inches in depth. The weight shall not exceed 44 pounds

3.1.4 Lithium Batteries. Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

3.2 Environmental Requirements. The Scope shall meet the environmental requirements for a Type II, Class 5, Style E equipment with the deviations specified below.

3.2.1 Temperature and Humidity. The Scope shall meet the conditions below:

	<u>Temperature(°C)</u>	<u>Relative Humidity (%)</u>
Operating	10 to 30 30 to 40	95 75
Non-operating	-40 to 70	Not Controlled

3.2.2 Electromagnetic Compatibility. The electromagnetic compatibility requirements of MIL-T-28800 are limited to the following areas: CE01, CE02, CS01, CS02 (0.05 to 100 MHz), CS06, RE01 (back panel search excluded), RE02 (14 kHz to 1 GHz), and RS03.

3.3 Reliability. Type II reliability requirements are as specified in MIL-T-28800.

3.3.1 Calibration Interval. The Scope shall have an 85% or greater probability of remaining within tolerances of all specifications at the end of a 12 month period.

3.4 Maintainability. The Scope shall meet the Type II maintainability requirements as specified in MIL-T-28800 except the lowest discrete component shall be defined as a replaceable assembly. Certification time shall not exceed 60 minutes.

3.5 Performance Requirements. The Scope shall provide the following capability as specified below. Unless otherwise indicated, all specifications shall be met following a 30-minute warm-up period.

3.5.1 Vertical System. The vertical system comprises the circuitry to drive the vertical deflection of the CRT and two plug-in compartments that are mechanically and electrically compatible with the Tektronix 7000 series plug-ins. The Scope shall have two channels that shall be referred to as left and right.

3.5.1.1 Bandwidth. The Scope shall have the bandwidth at least from DC to 500 MHz.

3.5.1.2 Risetime. The risetime of the Scope shall not exceed 700 ps.

3.5.1.3 Display Modes. The Scope shall have the display mode which shall allow the selections: Alternate, Left, Add, Right, and Chop (nominal frequency 1 MHz).

3.5.1.4 Delay Line. The Scope shall have a built-in delay line that allows the viewing of the trigger event.

3.5.1.5 Trace Separation. The Scope shall have a continuously variable control which adjusts the relative vertical positions of traces produced the two horizontal input channels. The B trace can be moved by four divisions above or below the A trace.

3.5.2 Horizontal Subsystem. The horizontal subsystem consists of circuitry to drive the horizontal deflection of the CRT and two plug-in compartments that are mechanically and electrically compatible with the Tektronix 70 series plug-ins, including amplifiers. For the purposes of this specification, the two channels are referred to as channels A and B. The horizontal sweep of the scope shall be selectable between channel A, channel B and alternating or chopped between the two.

3.5.3 Display. The Scope display shall be a CRT with usable display area of at least 7 cm by 9 cm.

3.5.3.1 Graticule. The Scope shall have graticule as follows: one graticule of at least 8x10 divisions with 0.9 cm/division in full scan and one of at least 8x10 divisions with 0.45 cm/division in reduced scan.

3.5.3.2 Beamfinder. The Scope shall have beamfinder to locate an off-screen signal.

3.5.4 Storage System. The Scope shall use a variable-persistence, analog storage display that includes at least five modes: No storage, Variable Persistence, Bistable, Fast Variable Persistence, and Fast Bistable.

3.5.4.1 Stored View Time. The stored view time of the Scope shall be at least 30 seconds in Variable Persistence and Fast Variable Persistence mode.

3.5.4.2 Stored Save Time. The stored save time of the Scope shall be at least 30 minutes in Bistable and Fast Bistable.

3.5.4.3 Erase Time. The erase time of the Scope shall be less than 1 second in any mode.

3.5.4.4 Stored Writing Speed. The minimum stored writing speed of the Scope shall be as follows:

Mode	Graticule Size	
	Full Scan(divs)	Reduced Scan(divs)
Fast Variable Persistence	300	8000
Fast Bistable	50	700
Variable Persistence	2	10
Bistable	0.03	0.2

### 3.5.5 Calibrator.

3.5.5.1 Waveshape. The calibrator waveshape of the Scope shall be an internal square-wave generator with a frequency of  $0.25 \pm 1\%$  Hz

3.5.5.2 Output Voltage. The output voltage of the calibrator shall have as follows:

Into 100 kohms or Greater:	40 mV, 0.4 V, 4 V.
Into 50 ohms	: 4 mV, 40 mV, 0.4 V.

3.5.5.3 Amplitude Accuracy. The amplitude accuracy of the square-wave shall not exceed  $\pm 1\%$ .

3.5.5.4 Rise Time and Fall Time. The rise time and fall time of the square-wave shall not exceed 250 ns into 100 pF or less.

### 3.5.6 Signal Outputs.

3.5.6.1 Sawtooth Output. The Scope shall provide sawtooth out connector which shall have positive 1 V/div  $\pm 10\%$  into 1 Megohm. The sawtooth signal shall derive from A or B Horizontal time-base sweep.

#### 3.5.6.2 Gate Output.

3.5.6.2.1 Source. The scope shall provide a Gate Out connector which shall be a 1 V positive-going rectangular pulse that shall be derived from either A or B time-base unit.

3.5.6.2.2 Output Voltage. The output voltage of the gate output shall be as follows:

0.5 V $\pm 10\%$ into 50 ohms
10 V $\pm 10\%$ into 1 Megohm

### 3.5.7 Vertical Signal Output.

3.5.7.1 Source. The Scope shall produce a signal which follows the input to the B-trigger.

3.5.7.2 Output Voltage. The output voltage of the vertical signal out shall be as follows:

25 mV/division of vertical deflection $\pm 10\%$ into 50 ohms
0.5 V/division of vertical deflection $\pm 10\%$ into 1Megohm

3.5.8 Remote Storage Control. The Scope shall have remote storage control to initiate a single sweep, save a display, and erase the display. These inputs shall be activated by grounding them and disabled by opening them.

3.5.9 Remote Fast Transfer. The Scope shall have remote fast transfer which shall be a TTL-compatible input. A zero to one transition shall enable the high speed target. A one to zero transition shall transfer from the high speed target to the storage target.

3.5.10 Phase Compensation. The Scope shall compensate for any phase difference from DC to 1 MHz between channels 1, 2, and B to allow for X operation.

3.6 Operating Requirements. The Scope shall provide the following capabilities.

3.6.1 Front Panel Control requirements. All modes and functions shall be operable using the front panel controls. The locations and labeling of indicators, controls, and switches shall provide for maximum clarity and easily understood operation without reference to tables, charts, or flow diagrams.

3.6.3 Compatibility. The Scope shall be compatible with the Tektronix 7000 series plug-ins, but not limited to, the 7A13, 7A22, 7A26, 7A19, 7B15, 7B9, 7L5, and the 7S14.

3.7 Manual. At least two copies of an operation and maintenance manual shall be provided. The manual shall meet the requirements of MIL-M-7298.

3.7.1 Calibration Procedure. The manual shall provide a Scope calibration procedure in accordance with MIL-M-38793.